Bone mineral density in pediatric inflammatory bowel disease

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I Schmidt S, Mellström D, Norjavaara E, Sundh SV, Saalman R. *Low Bone Mineral Density in Children and Adolescents with Inflammatory Bowel Disease: A Population-Based Study from Western Sweden.* Inflamm Bowel Dis 2009; 15 (12): 1844-50

II Schmidt S, Mellström D, Norjavaara E, Sundh V, Saalman R. *Familial Resemblance of Bone Mineral Density in Children with Inflammatory Bowel Disease.* In press (Journal of Pediatric Gastroenterology and Nutrition)

III Schmidt S, Mellström D, Norjavaara E, Sundh V, Saalman R. *Longitudinal Assessment of Bone Mineral Density in a Population of Children and Adolescents with Inflammatory Bowel Disease.* Submitted

IV Schmidt S, Mellström D, Norjavaara E, Nilsson S, Saalman R. *Body Composition, Growth and Puberty in Children and Adolescents with Inflammatory Bowel Disease.* In manuscript

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Abstract

Low bone mineral density (BMD) has been highlighted as a potential problem in children with inflammatory bowel disease (IBD), which is one of the most common chronic childhood diseases in the westernized world. The mechanisms behind reduced BMD in pediatric IBD are still not completely understood, but several factors that influence bone mineralization have been discussed. These include the chronic inflammation itself, which causes the release of cytokines from the inflamed bowel, treatment with corticosteroids, low body weight, limited physical activity, vitamin D deficiency and genetics. Decreased peak bone mass in young adulthood may predispose for the development of osteoporosis later in life and this in turn may lead to osteoporosis-related fractures.

The aim of this thesis was to investigate BMD, body composition and growth in a population of Swedish children and adolescents with IBD over a two-year period. A second objective was to study the familial resemblance of BMD in pediatric IBD patients.

The thesis was designed as a prospective, longitudinal, population-based project with patients from two pediatric centres in Western Sweden (Göteborg and Borås). In order to evaluate BMD and body composition the patients and their parents underwent dual-energy X-ray absorptiometry (DXA) at the time of inclusion in the study. Two years later the DXA measurement was repeated in the IBD patients. Additionally, clinical data, body weight, height, Tanner stage, bone age and blood samples for various hormone analyses were obtained. Age at peak height velocity (PHV) was calculated using special software.

Low bone mass was found to be prevalent in this population of Swedish pediatric patients with IBD both at baseline and at follow-up two years later. Possible risk factors for lower BMD are male gender, low BMI and treatment with azathioprine, which is a likely marker of disease course severity. However, the data indicate that both males and females have the potential to recover BMD into early adulthood. Furthermore, this study demonstrated that, regardless of the presence of a chronic inflammatory condition, the BMD of children and adolescents with IBD is significantly related to that of their parents. Normal vitamin D levels were present in the group of pediatric IBD patients and showed a significant seasonal variation with lower levels during winter time. No significant correlation was found between vitamin D levels and BMD. Elevated levels of intact parathyroid hormone (iPTH) were seen in the patients under 16 years of age despite normal vitamin D levels. Vitamin D and iPTH levels were inversely related. Lean mass deficits were present in the oldest age groups and were most pronounced in males and those with Crohn's disease. Age at PHV was significantly delayed by around one year in both females and males and this may indicate pubertal delay.

The data from this thesis support the conclusion that pediatric patients with IBD should be evaluated with DXA at some point during the course of their disease, if possible soon after being diagnosed.

Key words: bone mineral density, inflammatory bowel disease, children, Crohn's disease, ulcerative colitis, vitamin D, parathyroid hormone, familial resemblance, body composition, growth

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